2019 Temperature Study

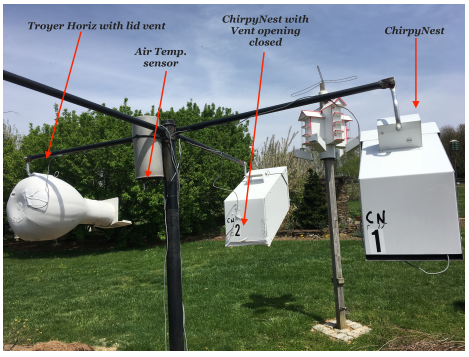
During the spring and summer of 2019, I expanded on the temperature study I conducted in 2017-18. For 2019 I set up a monitoring station having 2 ChirpyNest , 2 THG, and one Super gourd. In Each of these nesting cavities I mounted a temperature sensor connected to a station that recorded the maximum and minimum daily temperature reached inside the cavity. A sixth probe was positioned outside the cavities and shielded from the direct sun to record the maximum and minimum air temperature.

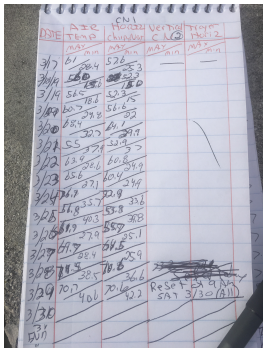
Inside the cavities, each sensor, was positioned 1-2 inches above the nest bowl. witch consisted of only pine needles, typical of a pre-nest that I build for my birds. These cavities were closed off at the entry using 1/2 inch hardware cloth, to prevent birds from using them . The 1/2 inch hardware cloth was used so as to not obstruct the flow of air into the cavity openings..

Three Taylor digital Min/Max temperature stations, commonly used to record maximum and minimum temperatures inside and outside a greenhouse, were used to track the temperatures through the season. Each of these stations has two sensors that can be put in two different cavities and will record the maximum and minimum temperature in each. Six days of data are stored in the stations and the oldest data is overwritten on the seventh day. I log the readings every few days so a not to lose any readings. At any given time a check of the current temperature can be made.

These are pictures of the setup and the insides of the cavity . A second THG and a Super-gourd was added to the setup picture shown below.

The view of the temperature sensor inside ChirpyNest above left, and THG right. Below left- monitor station. Right - log book to record data.





Following is a link to the raw data obtained from the readings from march thru September. To make a bit more use of the data, I used the period of May 1 - July 31 for analysis as this is the typical time that martins are raising young in my area of Abingdon Virginia.

https://www.peacefulvalleypurplemartins.com/2019-temperature-study

Just how much does the temperature inside cavities affect Purple martins? Definitive answers to that question are vague but based on some discussion with landlords, a build up of temperature seems to be a big factor in the number of jumpers, birds that fledge prematurely and end up grounded. In previous years at my colony there was always a period when I would find young birds grounded that were too young to be out of the nest. Being certain of the cavity a particular bird came from was difficult with eight poles and over fifty nesting pairs. Compounding the problem of getting the young back to the correct cavity is the fact that neighboring broods were at the stage where premature fledging is common. Trying to locate the correct cavity to place a grounded bird would often cause other young to jump or escape the intrusion. In 2019 I did away with any gourds t my colony so that if there were to be jumpers, I would be sure of the type of cavity they were from. Any jumpers would have to be from ChirpyNest since with the exception of a T-10 house that is located by itself, that is the only type cavity offered.

I've written in the past that "jumper season" is the most stressful time of the Martin season. Some landlords have considered giving up hosting martins because of the helpless feelings associated with finding young martins grounded. With zero jumpers in 2019, I am excited that this is another benefit of the cooler better ventilated ChirpyNest. I of course will continue to study this.

Another interesting observance from 2019 is that I was able to do nest checks up to the day before fledging. Because of a few late nesting pairs I was forced to lower my round rack for nest checks. While down I checked neighboring cavities with young that were 25-30 days along. To open the cavity and look inside for a count, the young stayed put and did not attempt to flee the cavity during or after the rack was raised. This in itself is not unusual but I continued on other racks with the same success and continued to check my colony on a regular basis the rest of the season. Not once did the older young try to fledged during these late nest checks. Puling the nest tray of young for inspection would lead to the young immediately jumping, either over the back of the nest tray into the back of the ChirpyNest or out of the cavity onto the ground. As long as I didn't pull the tray the birds were content and stayed put in the lower part of the ChirpyNest cavity. In 2020 I will further look at this.

Ventilation and Temperature

Many first reactions to the aluminum ChirpyNest is that it will be 'like an oven'. This misconception is far from the truth. From three seasons taking temperature readings, I have confirmed my hypothesis that ChirpyNest is a cooler ,better ventilated house than Plastic gourds.

This may be the time to state that I am not knocking or intending to put down any type of housing. Well-managed purple Martin colonies are my goal. The benefit of the Purple Martin species is the mission of us all. I have invested over 45 years of my life with a passion for Purple martins and for the past four years I have put that investment into the ChirpyNest. My intent is to share my love and passion for purple martins, along with my findings and my knowledge. It is my hope that I have solved many of the problems and annoyances of current Martin housing. In doing so I hope to make the landlord's job easier in someway. I am encouraging other landlords to incorporate ChirpyNest into their colonies. Explore the benefits that I have found and see if your job is easier as a purple Martin landlord with ChirpyNest. I am not saying all plastic gourds are the same. For my 2019 study the Troyer Horizontal with added tunnel entrances, and the Super-gourd were used. .

My findings using 2 ChirpyNest, 1 super gourd and 2 Troyer horizontal gourds (THG) , show that the THG is the hottest of the three followed by the vertical super-gourd.

See this chart:

Days Maximum Cavity Temp VS maximum air temp. May 1 - July 31

Unit Type	# days MAX temp below air Max temp	# days MAX temp < 1 degree above air max temp	# days MAX temp 1-3 degrees above air max temp	# days MAX temp 3-4 degrees above air max temp	# days MAX temp 4-5 degrees above air max temp	# days MAX temp > 5 degrees above air temp
ChirpyNest 2 Center Probe (CP)	**69 of 92 Days (75%)**	**19 of 92 Days. (21%)**	**4 of 92 Days. (5%)**			
Vertical Super-gourd no vent CP	**14 of 78 Days. (18%)**	**15 of 78 Days. (20%)**	**42 of 78 Days. (54%)**	**7 of 78 Days. (9%)**		
NON-vented THG CP	**5 of 78 Days (10%)**	**10 of 78 Days. (13%)**	**26 of 78 Days (34%)**	**12 of 78 Days (16%)**	**14 of 78 Days (18%)**	**11 of 78 Days. (15%)**

From the above chart:

- ***81% of the days between May 1- July 31, the Troyer Horizontal Gourd (THG) had a maximum daily temperature (MDT) of over 1 degree from the Maximum daily air temperature, versus 5% for the ChirpyNest.***
- ***48% of days between May 1- July 31, the MDT of the THG was 3 degrees or more over the MDT air temp. Versus zero days for the ChirpyNest.***
- ***The super gourd had 63% of the days between May 1- July 31, that MDT was over 1 degree from max air temp for those days.***

Keep in mind that I recorded only temperature. In a cavity with poor ventilation, the negative effects of high temperature are compounded from lack of air movement.

Venting helped reduce maximum daily temperature of the THG but venting only lowered the THG into the range of the vertical super-gourd .

Another finding from the summer of 2019, is that the neck of the THG will heat up early in the day and reach a higher temperature than the main cavity. This is important as the young grow and fill the neck of the gourds as they beg for food through the opening . This begging will reduce the air flow into the cavity as the birds block the opening. Even when a gourd is vented if air entering through the entrance is reduced by the young birds filling the entrance, then flow out the vent is reduced and the cavity will build up heat. Ventilation requires a flow in and out of the cavity.

This reduction in ventilation can occur in all housing that is not vented along with a separate air inflow. Drainage openings in the bottom of a gourd cavity do not function for ventilation because they get covered up with the nest. The ChirpyNest solves the air flow problem by having a rear cavity opening from which air is drawn in and a nest that is above the cavity floor built on the screen bottom nest tray and ventilation openings above the entrance. This design allows for flow through ventilation. Because the ChirpyNest cavity will not build up heat or accumulate moisture , I'm finding that the young will stay put until they are ready to fledge and be on their own.

One other point regarding the ventilation. Moisture in the cavity comes not only from rain but from respiration of the birds as well as from condensation on the walls of the cavity. This moisture will run down the sides and be absorbed by the nest material. When ventilation is

reduced this moisture may accumulate, negatively affecting the cavity environment. The design of the ChirpyNest prevents moisture problems in the nest cavity by keeping moisture from contacting the nest material, allowing it to evaporate easily.

From the chart below you can see that venting helps with cavity temperature in plastic gourds but does not solve the problem :
The chart below shows the effect of temperature and ventilation when the temperature sensor was located in the neck of the gourd:

- The THG with ***no vent*** and the sensor in the neck of the gourd had a maximum daily temperature over ***3 degree*** from that of the air for 84% of the days and 1 degree over for 92% of the days. .
- The ***vented*** THG still had a MDT over 1 degree from MDT of air for 56% of the days. And was over **3 degree** for 32 % of the days.

Days Maximum Cavity Temp VS maximum air temp.

Unit Type	# days MAX temp below air Max temp	# days MAX temp < 1 degree above air max temp	# days MAX temp 1-3 degrees above air max temp	# days MAX temp 3-4 degrees above air max temp	# days MAX temp 4-5 degrees above air max temp	# days MAX temp > 5 degrees above air temp
THG no vent -Probe in neck- July 7/7-7/31	**0 Of 25 days**	**2 of 25 days (8%)**	**2 of 25 days (8%)**	**4 of 25 days. (16%)**	**7 of 25 days. (28%)**	**10 of 25 days (40%)**
THG rear Vent Probe in neck. AUG 1 - sept 15	**11 of 46 days (24%)**	**9 of 46 days (20%)**	**11 of 46 days (24%)**	**8 of 46 days (17%)**	**5 of 46 days (11%)**	**2 of 46 days (4%)**

If young are jumping and leaving the cavity before they are ready to fly, these high temperatures along with reduced ventilation could be a major factor .

Specific temperatures recorded for these studies are found in the other links on the main page under ChirpyNest research and data.